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ABSTRACT

In relating brain hemisphere differences to education and educational administration, the author reviews literature on the issue and discusses the concepts involved. For background, he briefly goes over the history of brain and cognition studies and the advent of "split-brain" studies and the "triune" brain theory. Definitions are then given of the brain itself and of hemispheric specialization theory. The latter theory is further described in the next section, on the left and right cerebral hemispheres. A listing of the characteristics of each side is given; the left side is considered the more analytic and logical and the right the more emotional and synthesizing. The author concludes that more research is needed to apply split-brain theory to education and notes that research results so far are not conclusive. He suggests research on the origins of cerebral asymmetry, the learning of cognitive modes, and the relationship of cerebral dominance to situational factors. More attention in teaching should be given, he says, to the brain's right side. Among the implications noted for educational administrators are that planners use the right side, managers the left, but both roles are needed for educational policy-making. (RW)

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BRAIN HEMISPHERES:

ADMINISTRATORS MUST LOOK ALSO TO THE RIGHT

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By

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Educational Administration

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BRAIN HEMISPHERES:

ADMINISTRATORS MUST LOOK ALSO TO THE RIGHT

Introduction

The brain is the organ that makes us think and dream, functions which have always been a mystery to human beings. Today, advances in technology have allowed us to make progress in unlocking some of these secrets of the brain's functions.[1] Recent research "into the structures and functions of the human brain"[2] indicates significant advances have been made in the study of the brain's operations--particularly related to hemisphere dominance. Such research has provided data important in the development of instructional strategies to facilitate and maximize the learning of individuals and has important implications for application to administrative organizations in education.

Understanding the brain involves learning the answers to complex questions which originate in both the scientific and the educational communities. Major questions which remain to be answered are those which follow:

> --What are the components of the brain, and how are they connected one to another?

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[1]Laurence Cherry, "Can the Brain Understand the Brain?" Family Weekly (November 9, 1980):4.

[2]M. C. Wittrock et al., The Human Brain (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1977), ix.

--What are the functions of those components, and how do they work together?

--How do people think?

--How do they learn?

--How does memory work?[3]

Answering these questions will allow us to understand how the brain functions, and how we come to think, see, hear, and feel as we do.

We all sometimes wonder why "some things come so easily and others seem so difficult."[4] Learning how the brain works can help us learn why this occurs, and learning how and why the hemispheres of the brain function as they do (both separately and together) can help us learn to use our brains more efficiently. Educators can use the knowledge gained from brain research to develop better instructional strategies and the application of such research findings to the administration of education can result in more efficiently run educational institutions.

A review of the available research produced numerous sources related to this topic. The Reference List provides sources cited in this paper and the Bibliography cites works which provide background information for further study of this topic.

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[3]Ibid., p. 4; and Judith Brody Saks, "Latest Brain Research Offers Lessons in Learning," The Executive Educator (October 1979):26.

[4]Henry Mintzberg, "Planning on the Left Side and Managing on the Right," Harvard Business Review 54 (July/August 1976):49.

Background

The art of teaching has been influenced since the days of ancient Greece and Rome by beliefs about the functions of the human brain as related to learning.[5] From Aristotle to the scientists and educators of the present, the perceptual and processing functions of the brain in gathering and storing knowledge have been subject to many research studies and projected theories in attempts to discover how the brain conducts the learning process. The theory of hemisphere dominance is not new but recent studies have resulted in new information which is leading to new conclusions about the effect of hemisphere dominance on the individual learner and on the society in general.

For the past seventy-five years American educational methods have been heavily influenced by behaviorist conceptions and studies of learning "rather than the constructive qualities of the mental process."[6] The recognition of hemisphere differentiation and the effect of hemisphere specialization on learning has been turning the attention of educators to the study of information processing and cognitive modes of learners, and has been changing previous conclusions. The "constructing" of information was considered the job of the "major" hemisphere, the left, until more recent research validated "the

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[5]Jeanne S. Chall and Allan F. Mirsky, eds., Education and the Brain: The Seventy-Seventh Yearbook of the National Society for the Study of Education, Part II (Chicago: University of Chicago Press, 1978), p. 61.

[6]Ibid., p. 62.

importance of the cognitive operations carried out by the right hemisphere."[7] The importance of the "minor" hemisphere, the right, became recognized after significant evidence of distinct characteristics of each brain hemisphere and the interrelations of both was provided by Bogen and Sperry in the early 1960s.[8]

Their work involved the severing of the corpus callosum, the connecting tissue between brain hemispheres, and has come to be called "split-brain" surgery. The conclusions of this research, based on the results of pre- and post-operative tests, were that the corpus callosum is the exchange route for information between the two hemispheres of the brain and that the inability of patients to coordinate their actions and information post-operatively meant that each hemisphere could be described as having specialized functions and as performing specific tasks. In the "split-brain" patients thinking was no longer integrated and information received in one hemisphere could not be augmented by the information processed by the other hemisphere.[9] It was concluded, therefore, that each hemisphere is specialized but that they have important interrelationships necessary for effective learning and performance.

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[7]Wittrock, Human Brain, p. 97; and J. A. Paredes and M. J. Hepburn, "The Split Brain and the Culture-and-Cognition Paradox," Current Anthropology 17 (1976).124.

[8]"The 'vasari' diary," Art News 76 (April 1977):4; Wittrock, Human Brain, p. 91; and Roger W. Sperry, "Left-Brain, Right-Brain," Saturday Review (August 1975):31.

[9]Suzanne Foster, "Hemisphere Dominance and the Art Process," Art Education 30 (February 1977):28; and Daniel Goleman, "Split-Brain Psychology: Fad of the Year," Psychology Today (October 1977):90.

Brain research has not only shown that brain hemispheres specialize, but that verbal functions are in the left hemisphere and that visual functions are in the right hemisphere. Prior to this discovery, it was believed that handedness revealed on which side of the brain were the verbal functions of the person. Left-handed individuals were thought to be converse of right-handers in terms of brain organization. However, recent research disproves that belief and substantiates the reliance of most left- and right-handers on the left hemisphere for verbal functions.[10]

Another theory about how and why the brain works as it does has been proposed by Dr. Paul MacLean, the Chief of the Laboratory of Brain Evaluation and Behavior at the National Institute for Mental Health. MacLean's concept of the brain is that it is essentially "three brains in one."[11] The first part of the brain he describes as the very old "Reptilian Brain," dating in origin from the Mesozoic Era. This brain reflects our relationship to reptiles, says MacLean. Much later a larger and more elaborate brain developed around and above the reptilian brain and formed the "old Mammalian brain, the equivalent of the limbic system.[12] This brain reflects our relationship to early mammals. The third and newest part of the brain is the

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[10]Betty Edwards, Drawing on the Right Side of the Brain (Los Angeles, California: J. P. Targer, Inc., 1979), p. 43.

[11]Saks, "Brain Research," p. 26.

[12]Marilyn Ferguson, The Brain Revolution: The Frontiers of Mind Research (New York: Taplinger Publishing Company, 1973), p. 31; and Leslie A. Hart, "The Three-Brain Concept and the Classroom," Phi Delta Kappan 62 (March 1981):504.

grant cerebrum or "New Mammalian" brain, which developed over this middle structure. "The cerebrum comprises left and right hemispheres, normally connected by a body of nerve pathways called the corpus callosum,"[13] Each of these parts has a unique role in the brain's functioning. It has been proposed by MacLean that his conception of a "triune brain" can allow us to understand the complexity and seeming contradictions in the behavior of people. The triune concept is offered as a means by which to explain why people react at one moment "rationally," at another "emotionally" and at another "stubbornly."[14] MacLean believes that "mixed" behavior can now become understandable.

Though MacLean's ideas are interesting, further study and validation of his ideas is necessary. Therefore, the emphasis in this paper will be on the findings specifically related to hemispheric specialization and such "mixed" behavior as MacLean describes will be related to these findings. How the two halves of the brain have different functions and how they are different in the ways they relate to the world will be discussed.

Definitions

The human brain is an organ which weighs between three and three and a half pounds. It is bilaterally symmetrical and has a wrinkled gray outer surface called the cortex. It is this outer surface which contains the billions of brain cells, called neurons, which

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[13]Hart, "Three-Brain Concept," p. 504.

[14]Ibid., p. 505.

make up this complex master organ of the body. These neurons are the cells through which the electrical connections of the brain are made and impulses passed through the mind.[15] This complex, computer-like system of sending messages to all parts of the body coordinates thoughts with actions,[16] and maintains the involuntary functions of the body. When any of the four lobes of the cortex are injured, specific functions of the body are either impaired or stopped.[17] The brain is truly a "vital" organ.

The brain may be described in several ways, depending upon the orientation of the person. It is a "collection of specialized cells, complexly arranged yet with commonalities" to the structure-oriented antomist. To the process-oriented physiologist, it is "an electrochemical mechanism that interacts with its environment and itself in particular ways." To the chemist it is "an incredible biochemical system specialized for the processing of information."[18] In summary, the brain can best be understood in terms of the inter-relation of structure to action to process. An understanding of the harmonious interactions within the brain is important to understanding its optimal functioning.[19] This knowledge about how the brain works

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[15]Cherry, "Can the Brain," p. 4; and Wittrock, Human Brain, p. 5.

[16]Ferguson, Brain Revolution, p. 17.

[17]Wittrock, Human Brain, pp. 6-8.

[18]Ibid., pp. 3-4.

[19]Richard M. Restak, The Brain: The Last Frontier (Garden City, New York: Doubleday & Company, Inc., 1979), p. 29.

can help educators more effectively educate by showing them the context within which the brain assimilates information.

The brain essentially "handles information for the purpose of communication and control."[20] However, a phenomenon about which educators must come to learn more is that the brain "actively constructs its own interpretations of information and draws inferences from it.[21] In fact, the brain ignores some information and selects other information, actions to which we all sometimes attribute our store of "trivia."

Despite the implications of recent research findings, we still know relatively little about "brain processes associated with thinking, reasoning, motivation, and other cognitive processes."[22] Many mysteries of the brain still remain mysteries: others seem within our grasp. The theory of hemispheric specialization is one of these.

Simply stated, hemispheric specialization means that the two halves of the brain "have different functions and are different in the ways they relate to the world."[23] Perceptual differences between hemispheres relate to these different cognitive modes of processing information. The implications are that the dominance of one hemisphere over the other will create a preference of the individual for

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[20]John D. French, ed., Frontiers in Brain Research (New York: Columbia University Press, 1962), p. 74.

[21]Chall, Education and the Brain, p. 107.

[22]Wittrock, Human Brain, pp. 26-27.

[23]Saks, "Brain Research," p. 27.

a certain mode of learning (professing). Handling input in the most relevant mode involves the work of the hemispheres as an integrated unit but dominance affects what is the most relevant mode for that person.[24] Numerous studies have attempted to isolate the specific functions of each hemisphere and a representative description of the right and left hemispheric modes of functioning is represented in the following section.

Left and Right Cerebral Hemispheres

The human nervous system is connected to the brain in a "crossed-over" fashion. This means that the left brain hemisphere controls the right side of the body and the right hemisphere controls the left side.[25] For this reason most left-handed people are believed to have dominant right hemispheres and right-handed people dominant left hemispheres. This dominance has a direct influence on an individual's behavior related to several factors. These factors are the specialization functions of the dominant hemisphere, the degree of dominance and the degree of "lateralization" (chance of specialty) of information processing between the two.[26] Handedness and cognitive mode will be discussed but first the specializations of each hemisphere,

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[24]Foster, "Hemisphere Dominance," p. 29.

[25]Edwards, Drawing, p. 26; Harvey A. Schwartz, "Cerebral Organization, Handedness, and Education," Academic Therapy 16 (September 1980):97; and James S. Williams, "Bicameral Mind," Finance Magazine (August 1977):6.

[26]John R. Kershner, "Reading and Laterality Revisited," The Journal of Special Education 9 (Fall 1975):271.

as summarized from recent research, will be described to create a base for understanding the distinctions made between "left" and "right" modes of information processing.

Each side of the brain is specialized for different cognitive functions. Therefore, an individual "at the same time is able to perceive reality in two separate and distinct terminologies," one perception based on a linguistic, mathematical system of thought and the other perception based on a visual, artistic system of thought.[27] Developing as we mature, these "dispositions" for a dominant means of perceiving and thinking indicate not only a fine to a particular hemisphere for each of us but also links to help us understand our emotional processes, our abilities to form facial recognitions, our degrees of creativity, and even our career choices. The delineation of characteristics defined by the research as appropriate to each hemisphere can help us recognize the influence of the dominant brain hemisphere on the formation of our cognitive mode of thinking and learning.

The descriptions of the left and right hemispheres which follow represent a composite "verbal" picture of each. These pictures were adapted from a number of sources which are cited in the footnote following the description of the right hemisphere.

The LEFT HEMISPHERE is predominantly involved in analytic, rational thinking, logical reasoning, and linear and sequential tasks which are abstract and time related. Data processed by the left

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[27]Schwartz, "Cerebral Organization," p. 95.

hemisphere are related to "temporal" or propositional factors. Relationships built across time and "if-then" statements are therefore formed as left hemisphere functions. The left hemisphere is specific to part to whole relationships, and to language processing and linguistic and mathematical ability. The dominance of the left hemisphere causes an individual to "think" in words rather than images.

The RIGHT HEMISPHERE is predominantly involved in synthetic, emotional thinking, intuitive reasoning, and holistic and simultaneous processing of environmental information ("Gestalt" processes). Data processed by the right hemisphere are related to "spatial" or oppositional factors. Relationships built across space and that involve three-dimensional visualization are formed as right hemisphere functions. The right hemisphere is specific to visual-spatial brain processes, while (not part) relationships, and to musical and artistic ability. The dominance of the right hemisphere causes an individual to think in "images" rather than words.[28]

To summarize the previous descriptions and represent them in a contrast, the table which follows was prepared.

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[28]These composite definitions were summarized from the works which follow: Paul Bakan, "The Right Brain is the Dreamer," Psychology Today (November 1976):67; Rick Brook, The Relationship Between Piagetian Cognitive Development and Cerebral Cognitive Asymmetry (Bethesda, Md.: ERIC Document Reproduction Service, ED 160 224, 1978), p. 32; Chall, Education and the Brain, pp. 65, 70; Edwards, Drawing, p. 35, Elda Franklin and David A. Franklin, "The Brain Research Bandwagon: Proceed with Caution," Education Digest 44 (February 1979):60; S. V. Garrett, "Putting Our Whole Brain to Use: A Fresh Look at the Creative Process," Journal of Creative Behavior 10 (1976):239; Goleman, "Split-Brain," p. 149; Michael P. Grady and Emily A. Lueuke, eds., Education and the Brain (Chicago: University of Chicago Press, 1978):

GLOBAL DESCRIPTORS OF HEMISPHERIC
MODES OF INFORMATION PROCESSING

Left	Right
verbal	visual
auditory	motoric (tactile kinesthetic)
mathematical	artistic
analytic	synthetic
rational	emotional
realistic	idealistic
logical	analogical
categorical	imaginative
intellectual	intuitive
linear	holistic
sequential	simultaneous
defuctive - convergent	inductive - divergent
singular	multiple
temporal	spatial
propositional	oppositional
symbolic	literal
abstract	concrete
causal	coincidental

Another important difference between left and right hemispheric functioning is that the left brain is characterized by "consciousness" whereas the right brain has much of its functioning in

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Madeline Hunter, "Right-Brained Kids in Left-Brained Schools," Education Digest 42 (February 1977):9-10; Thomas Isaack, "Intuition: An Ignored Dimension of Management," Academy of Management Review 5 (October 1978):920; Nancy Kane and Martin Kane, "Comparison of Right & Left Hemisphere Functions," Gifted Child Quarterly 23 (Spring 1979): 157-158; David Loye, "The Forecasting Mind: How Left-, Right', and Forebrain Work Together to Predict Futures," The Futurist (June 1979): 174-175, 178; Mintzberg, "Planning," p. 49; R. E. Ornstein, "Right and Left Thinking," Psychology Today 6 (May 1973):87; Paredes, "Culture-and-Cognition," p. 125; Harold A. Sackeim, Ruben C. Gur, and Marcel C. Savey, "Emotions Are Expressed More Intensely on the Left Side of the Face," Science (October 1978):434-436; Saks, "Brain Research," p. 27; Schwartz, "Cerebral Organization," pp. 95, 98; Sperry, "Left-Brain," p. 31; "'vasari' diary," p. 23; Grayson H. Wheatley, "The Brain Hemispheres Roles in Problem Solving," Education Digest 43 (January 1978):51; Williams, "Bicameral Mind," p. 8; and Wittrock, Human Brain, p. 107.

"the realm of the unconscious."[29] The right hemisphere is considered the repository of emotions and dreams not only for its characteristics of imaging but also for its level of activity during REM (rapid eye movement) or "dream" sleep. This fact is also proven by results that show that persons who suffer brain damage often lose their power to dream.[30] Because both functions of emoting and dreaming are related to the imaging, nonverbal, perceptual and spatial aspects of the right cerebral hemisphere we can readily believe that the left side of the face expresses emotions more intensely and, in "mirror" composite pictures, the left side of the face is judged more like the "true" face than a composite of the right side.[31] The effects of the right brain are more keenly felt by us than we have realized before this research finding.

Right brain dominance and the corresponding functions of visual spatial perception, holistic understanding, insight, tactile sensation, and ability to intuit and "image" have caused some researchers to conclude that right-brained individuals are more creative, based on their ability to create new ideas and to expand on established ideas through originality and elaboration.[32] This is a controversial issue however because other researchers identify the hemispheric differences as having more to do with the "verbal or nonverbal nature of the creative

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[29]Loye, "Forecasting Mind," p. 175.

[30]Bakan, "Dreamer," pp. 67-68.

[31]Sackeim, "Emotions," p. 434.

[32]Garrett, "Whole Brain," p. 240.

enterprise rather than with creativity itself."[33] The issue may be resolved when agreements as to the bases of creativity can be reached.

The relationship of creativity to the dominance of the right hemisphere may also have an important connection to career choice. Because so many artists and architects have been found to be "lefties" it may be that there is a strong relationship between certain types of creative involvement and the spatial development associated with right hemisphere dominance.[34] The fact that these and other similar occupational fields (including sports, music and other of the fine arts) require spatial and dexterity perception and ability may explain the predominance of left-handedness. Controlled directly by the right hemisphere, the left hand may be more "naturally" attuned to instantaneous and simultaneous activities required in these endeavors.[35] Further research is needed to substantiate and validate such claims.

Conclusions

Education has long had value to society in its function of transmitting traditional values. Recent research findings are also supporting the belief of many persons that education's role is more than cultural, it also includes the development of human brainpowers.

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[33]Michael C. Corballis, "Laterality and Myth," American Psychologist 35 (March 1980):288.

[34]Rex Dorethy and Dan Reeves, "Mental Functioning, Perceptual Differentiation, Personality, and Achievement Among Art and Non-Art Majors," Studies in Art Education 20 (1979):55-57; Foster, "Hemisphere Dominance," p. 29; and "'vasari' diary," p. 22.

[35]Corballis, "Laterality," p. 286; and Dorethy, "Mental functioning," pp. 55-57.

As research provides stronger evidence to validate the importance of education in human development, it also points to the importance of the "physical aspects of the brain for the functioning of the psychological processes central to learning, such as attention, cognition, motivation, and language."[36] Brain hemisphere differentiation is one area being proved to discover more about how we learn and how educators can enhance the learning process.

A problem for educational research is that criticisms of such studies have grown rather than abated.[37] Each year more information is added to our store of knowledge but some researchers and critics of education feel the emphasis on hemisphere function approximates the attention given to other educational "bandwagon" issues.[38] Hopefully, criticisms of "split-brain" functioning will be reduced as explanations of hemisphere dominance become more specific and are validated by additional research studies.

The research findings gathered for this paper indicate one general conclusion. A lot of conflicting data have been gathered on hemisphere differentiation and brain function and more study and reliable evaluation are necessary before the implications of hemisphere dominance can be applied to educational practice. The research on brain hemisphere dominance suffers from "a lack of precision in the

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[36]Chall, Education and the Brain, p. 371.

[37]John Martin Rich, "Holistic Thinking in Education," Educational Forum 39 (March 1975):329.

[38]Leslie A. Hart, "The New Brain Concept of Learning," Phi Delta Kappan 59 (February 1978):89; and Loye, "Forecasting Mind," p. 174.

selection of variables, measures and subjects. Much of the research is highly speculative and forms oversimplified and faulty relationships and causality."[39] The indexes used and the type and amount of information gathered show a lack of consistency among research projects and the results of many studies are often inconclusive. Much of the research is conducted with other than normal subjects, usually those with brain dysfunction, and most frequently on right-handed persons.[40] The findings of such research may not be accurate for all individuals.[41]

It is believed by some researchers that right-handed subjects represent a more homogeneous group in terms of cerebral organization,[42] but other studies show no relationship between handedness and brain hemisphere dominance.[43] Genetic factors as related to handedness and hemisphericity have been studied but no relationship has been established based on research findings.[44] Research studies, however, have not invalidated these hypotheses either. Much work remains to be done.

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[39]Dorethy, "Mental Functioning," pp. 61-62.

[40]Franklin, "Bandwagon," p. 59; and M. Thomson, "Laterality and Reading Attainment," British Journal of Educational Psychology 45 (1975):321.

[41]Chall, Education and the Brain, p. 201; and Schwartz, "Cerebral Organization," p. 96.

[42]Franklin, "Bandwagon," p. 59.

[43]Corballis, "Laterality," p. 289; Foster, "Hemisphere Dominance," p. 28; Albert M. Galaburda et al., "Right-Left Asymmetries in the Brain," Science 199 (February 24, 1978):854; and Saks, "Brain Research," p. 27.

[44]Kershner, "Reading and Laterality," p. 271.

A major issue about hemisphericity which needs resolution is the origin of cerebral asymmetry. Some researchers argue the innate, or genetic, origin[45] and others emphasize the effects of environment and training on the development of functional cerebral asymmetry. They attribute highly developed skills specific to a dominant hemisphere to practice, not to inherent ability.[46] Therefore, the environmental experiences are believed by the second group to have the greatest impact on perceptual processing and lead to the preferential development of the brain hemispheres.[47] This developmental approach has of course been challenged by the first group but a decision on this issue remains to be reached.

How different strategies (cognitive modes) of information processing are learned is a question which, when answered, might explain the differences in laterality of brain function.[48] This answer might explain why "evidence shows that individuals and groups vary, their mental and brain makeup varies, and everyone is not right or left dominant in the same way."[49] The influences of situational and cognitive factors will have to be considered in determining the causal influences leading to asymmetry of perception. Important also will be the consideration of the integrative function of the two hemispheres.

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[45]Ibid., pp. 262-263; and Galaburda, "Asymmetries," p. 854. Also see the list of references to other sources in these works.

[46]Max R. Rennels, "Cerebral Symmetry: An Urgent Concern for Education," Phi Delta Kappan 57 (March 1976):471-472; and Restak, Last Frontier, p. 9.

[47]Dorethy, "Mental Functioning," p. 61.

[48]Chall, Education and the Brain, p. 78.

[49]Dorethy, "Mental Functioning," p. 60.

The brain hemispheres have both dual and integrated functions as has been studied in the performance characteristics of individuals. Franklin and Franklin (1979) and Foster (1977) concluded that their studies showed that asymmetrics in lateral function and information processing represented biases in attention which were stimulus specific rather than produced by hemispheric dominance.[50] For example, the type of question asked might trigger activity in one or the other hemisphere (usually the left in educational settings) and such over-attention and stimulation is believed to have the cumulative effect of suppressing the hemisphere least stimulated.[51] These conclusions could have important implications for educational practice and for application to the functioning of educational administrators if the findings can be validated.

The recent emphasis on the cognitive style of the learner is an area of attention and research which may reveal valid conclusions about hemisphericity.[52] This shift away from the behaviorist orientation toward information processing and cognitive modes ("mentalist" terms) may result in generalizations about laterality effects and implications for education.[53] Minimally we may expect that such effects and generalizations about them will either be verified or

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[50]Foster, "Hemisphere Dominance," p. 29; and Franklin, "Bandwagon," p. 61.

[51]Ibid.

[52]Saks, "Brain Research," p. 27.

[53]Sperry, "Left-Brain," p. 32.

rejected--a conclusion reached as more sophisticated research methodologies permit experimenters more accurate evaluation of hemispheric functions.

One tentative conclusion on which educational practice by some "right" thinkers has already been based is attention to the right side of the brain in our methods of teaching. The neglect of the right brain capabilities can be attributed to the comparatively low esteem in which "the arts" are held as compared to "the classical" subjects.[54] Learning through "our eyes and ears is no less important than language . . . yet the arts are the first to be cut when budgets are small . . . when time is limited."[55] Teaching the arts is as essential "to some kind of learning and knowing as arithmetic is to math and syntax is to language."[56] Our educational system, however, continues to cater to the left brain and our administrative organizations duplicate this which is considered an error to many. Unless the whole brain is utilized, "effective communication, change, learning, and problem dissolving" will be hindered.[57] It seems an appropriate conclusion to support the development of both sides of the brain, and in our educational methods of teaching and organizations to achieve a balance and an integration of hemispheric brain functions.

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[54]Edwards, Drawing, vi; and Loye, "Forecasting Mind," p. 175.

[55]Garrett, "Whole Brain," p. 246.

[56]Ibid., p. 241.

[57]Benjamin I. Young, Jr., "A Whole Brain Approach to Training and Development," Training and Development Journal (October 1979):44.

Implications for Educational Administration

The likelihood that in the near future important discoveries related to finding out how we learn, think, and remember may be made, and that we can apply this knowledge to education are exicting possibilities for educators. With this knowledge schools could be designed and organized, along with appropriate teaching techniques, around the theme of "brain-compatibility,"[58] Using teaching strategies compatible with the mode of information processing of the individual would mean the provision of stimuli appropriate to each side of the brain. Instead of a brain-antagonistic environment in which to perceive, conditions would be created for the balanced presentation of stimuli to the brain which is necessary for the optimal development of brain potential.[59] As Kershner (1975) stated, we need to stress this development of an optimal balance between linguistic processing and spatial processing to enhance the learning skills of the student. "Two hemispheres are better than one."[60] Certainly an integration of the two is the most desirable end result of education.

The right and the left hemispheres both need to be exercised by today's child--and adult--because neither is superior but both are essential to integrated thinking.[61] Both sides of the brain must be developed if all facets of intellectual capacity are to become

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[58]Hart, "New Brain Concept," p. 396.

[59]Foster, "Hemisphere Dominance," p. 29.

[60]Kershner, "Reading and Laterality," p. 278.

[61]Sperry, "Left-Brain," p. 33.

integrated and symmetry achieved. Stimuli will have to be presented which involve the development of the brain hemispheres both independently and integratedly. We must not ignore the development of half our brainpower. Such deprivation can handicap the students, the function of the organization, and, in the long run, all students and society.

Achieving a high degree of coordination between brain hemispheres and a balance of functions both in the individual and in society is a major task for educators and the administrators of educational institutions.[62] Both have long tried to reduce the boredom and poor performance which exist at all levels of the educational bureaucracy. Equal attention to and education of all aspects of the brain may help solve these related problems. While in most of us one or the other brain hemisphere is dominant, we draw to some extent on both halves of the brain--though not always "wittingly."[63] Because all the parts of the brain work together, all are therefore entitled to this type of equality in educational opportunity.

Creative thinkers are alike in their "process of perceiving the world, intuiting phenomena, emotional responses, or interrelationships," and finding the appropriate mode of expressing their visions.[64] Imagers, these "creative" people are able to develop and use their intuitive powers at a high level. "Imaging the future and planning

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[62]Grady, Education and Brain, conclusions.

[63]Loye, "Forecasting Mind," p. 177.

[64]Garrett, "Whole Brain," p. 239.

action based on anticipated needs and occurrences" is a task at which these people excel because though they usually have a dominant right hemisphere, they have developed ability as integrated thinkers.[65] They are able to draw from both the "rational" left and the "intuitive" right brain and process the information in a balanced manner. The pictures they form of the future may be those on which plans and decisions are based in that future time. These persons are known as our planners.

Managers are those people who have a dominant left brain, they are more rational and reasonable in their dealings with reality and, instead of imaging, they verbalize.[66] They function logically and sequentially and are temporally bound. They are also known as our "problem solvers." In contrast, the planners to which we have referred are called our "problem dissolvers."[67] They are not bound by time and are able to visualize and intuit, by which means they are able to anticipate and plan to prevent the formation of problems which then have to be solved by managers.

Educational policy making is a part of administration which is the work of both managers and planners. In other words, "the right hand must know what the left hand is doing" so both types of cognitive processing are necessary to form the most potentially

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[65]Loye, "Forecasting Mind," p. 173.

[66]Mintzberg, "Planning," p. 49; and Young, "Brain Approach," p. 44.

[67]Young, "Brain Approach," p. 44.

successful policies.[68] The concept of brain hemisphere differentiation can therefore be seen as having an important relationship to the administration of education because both sides must function independently to perceive and sort information while both must work together to process the information to form the most appropriate conclusions. Educators and administrators must strive to achieve this balance in their presentation of stimuli within their respective environments.

Unless we are consciously using our whole brain "in concert, we are working against ourselves."[69] We do not form images which are representative of the total of each hemisphere's input. Our communication effectiveness is reduced and we become less capable as thinkers. Learning is hindered. To educate the human mind, and to achieve the highest levels of brain functioning, we must realize and acknowledge the dual and integrative functions of each facet of the brain. Learning about brain activity and information processing has important implications for the future of education.

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[68]Michael E. Manky-Casimir, On Policy-Making: Lessons from the Left Hand (Bethesda, Md.: ERIC Document Reproduction Service, ED 158 438, June 1978), pp. 1, 15.

[69]Young, "Brain Approach," p. 45.

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